

```

In [1]: #設定Jupyter與Matplotlib交互方法

In [2]: %matplotlib inline

In [3]: #字串處理

In [4]: import pandas as pd

In [5]: def CSV_To_TXT(File_Path, Save_Path):
    Data = pd.read_csv(File_Path, header=None)
    Processed_Data = list(Data.iloc[:, 4]) #取出CSV檔案中的第五行並轉換成List
    with open(Save_Path, 'w') as Output:
        Output.write(''.join(map(str, Processed_Data))).replace(',', '\n').replace(' ', '') #將List去掉 "[]" 和空格 · 並將 "," 改成換行

In [6]: CSV_To_TXT("/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/CSV/三頭肌持續出力.csv", "/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/三頭肌持續出力.txt")
CSV_To_TXT("/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/CSV/二頭肌持續出力.csv", "/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/二頭肌持續出力.txt")
CSV_To_TXT("/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/CSV/三頭肌最大出力.csv", "/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/三頭肌最大出力.txt")
CSV_To_TXT("/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/CSV/二頭肌最大出力.csv", "/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/二頭肌最大出力.txt")
CSV_To_TXT("/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/CSV/股二頭肌持續出力.csv", "/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股二頭肌持續出力.txt")
CSV_To_TXT("/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/CSV/股二頭肌最大出力.csv", "/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股二頭肌最大出力.txt")
CSV_To_TXT("/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/CSV/股內側肌持續出力.csv", "/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股內側肌持續出力.txt")
CSV_To_TXT("/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/CSV/股內側肌最大出力.csv", "/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股內側肌最大出力.txt")
CSV_To_TXT("/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/CSV/股外側肌持續出力.csv", "/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股外側肌持續出力.txt")
CSV_To_TXT("/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/CSV/股外側肌最大出力.csv", "/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股外側肌最大出力.txt")

In [7]: #數據分析

In [8]: import math
import numpy as np
import scipy as sp
import matplotlib.pyplot as plt
import biosppy

In [9]: #每次選取特定區間來計算RMS值

In [10]: def RMS_Plot(Input_Time, Input_Data, RMS_Sampling_Size): #RMS_Plot(NumPy一維陣列, NumPy一維陣列, 數字)
    RMS_Array = np.zeros(0) #建立空的一維陣列
    i = 0
    while i <= len(Input_Data): #
        Temp1 = 0 #設定初始值
        Average_RMS = 0 #設定初始值
        for j in range(RMS_Sampling_Size):
            try:
                Temp1 += Input_Data[j + i] ** 2 #計算平方和
            except:
                j = j - 1 #
                break
        Average_RMS = math.sqrt(Temp1 / RMS_Sampling_Size)
        RMS_Array = np.hstack((RMS_Array, np.full(j + 1, Average_RMS)))
        i += RMS_Sampling_Size

    plt.figure(figsize=(15,10))
    plt.plot(Input_Time, Input_Data, label='Filtered')
    plt.plot(Input_Time, RMS_Array, label='RMS')
    plt.legend()
    plt.title("EMG Summary With RMS")
    plt.xlabel("Time (s)")
    plt.ylabel("Amplitude")
    plt.show()

In [11]: def IEMG_Plot(Input_Time, Input_Data):
    IEMG_Array = np.zeros(0)
    for n in range(len(Input_Data)):
        try:
            Integrate_Result = sp.integrate.simps(np.abs(Input_Data[:n + 1]), Input_Time[:n + 1])
            IEMG_Array = np.hstack((IEMG_Array, np.full(1, Integrate_Result)))
        except:
            continue

    plt.figure(figsize=(15,10))
    plt.plot(Input_Time, Input_Data, label='Filtered')
    plt.plot(Input_Time, IEMG_Array, label='IEMG')
    plt.legend()
    plt.title("EMG Summary With IEMG")
    plt.xlabel("Time (s)")
    plt.ylabel("Amplitude")
    plt.show()
    #print(IEMG_Array)

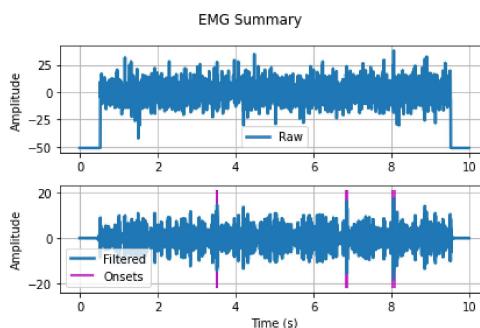
In [12]: def Plot_MPF(Input_Data, Sampling_Frequency):
    f, Pxx_den = sp.signal.welch(Input_Data, Sampling_Frequency)
    #f, Pxx_den = sp.signal.welch(Input_Data, Sampling_Frequency, nperseg=1024)

    plt.figure(figsize=(15,10))
    plt.semilogy(f, Pxx_den, label = 'MPF')
    plt.legend()
    plt.ylim([0.5e-3, 1])
    plt.xlabel('frequency [Hz]')
    plt.ylabel('MPF [V**2/Hz]')
    plt.show()

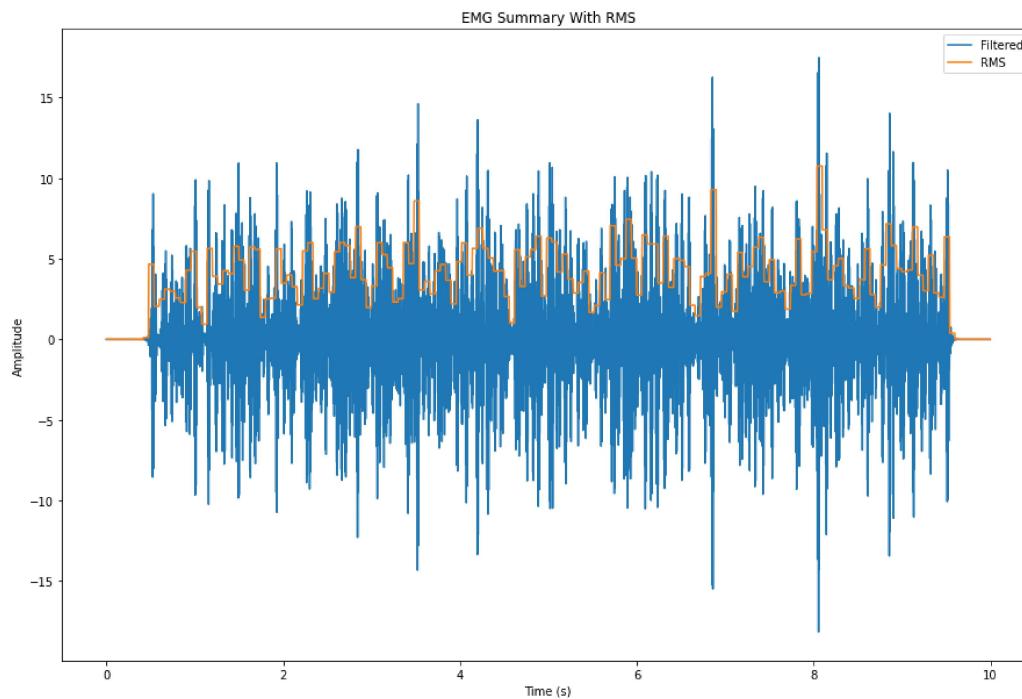
In [13]: #三頭肌持續出力分析

In [14]: Signal1 = np.loadtxt('/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/三頭肌持續出力.txt')
Processed_Signal1 = biosppy.signals.emg.emg(signal=Signal1, sampling_rate=250, show=True)

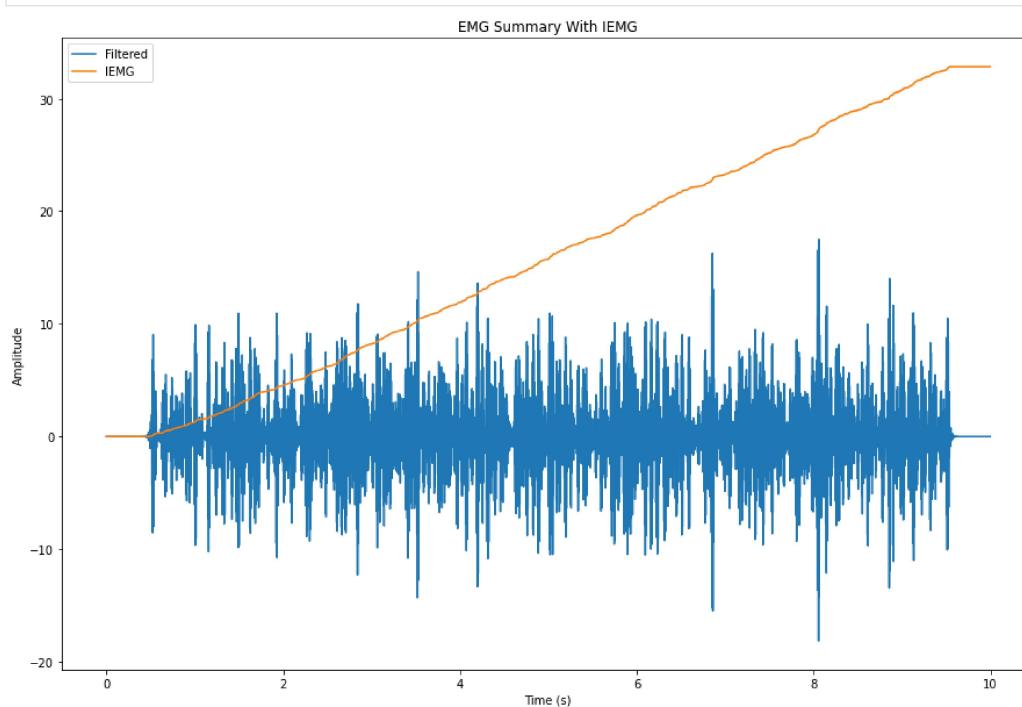
```



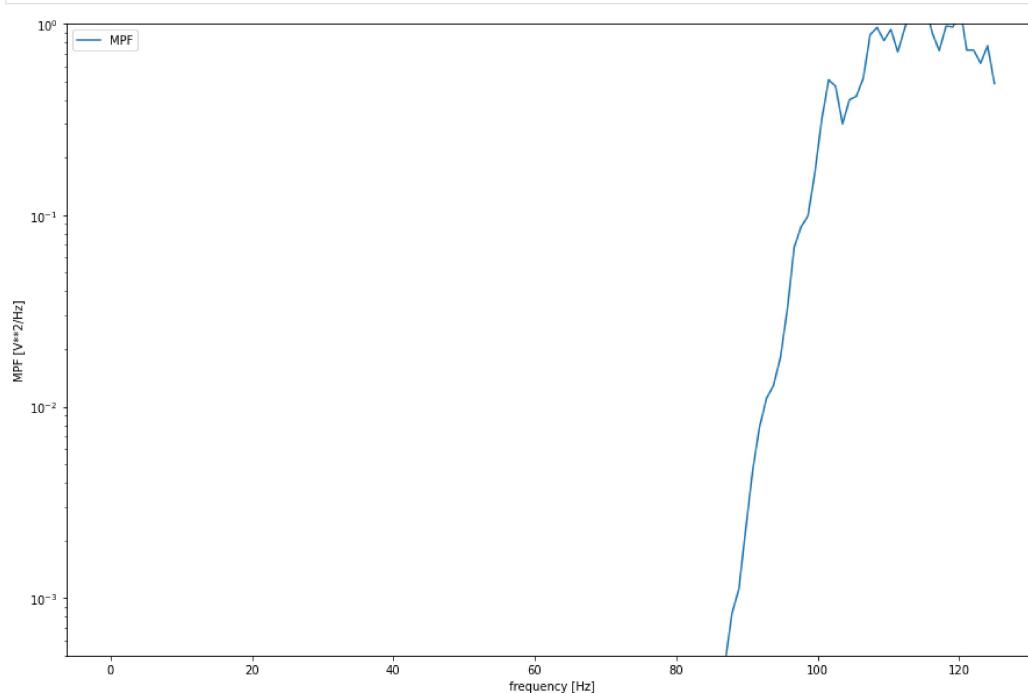
```
In [15]: RMS_Plot(Processed_Signal1[0], Processed_Signal1[1], 15)
```



```
In [16]: IEMG_Plot(Processed_Signal1[0], Processed_Signal1[1])
```

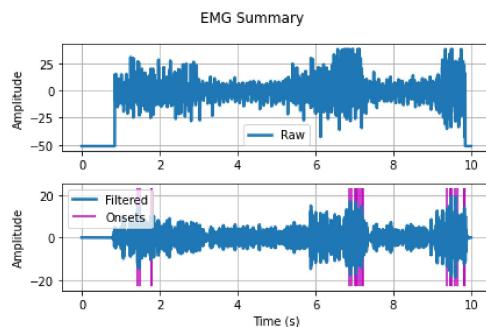


```
In [17]: Plot_MPF(Processed_Signal1[1], 250)
```

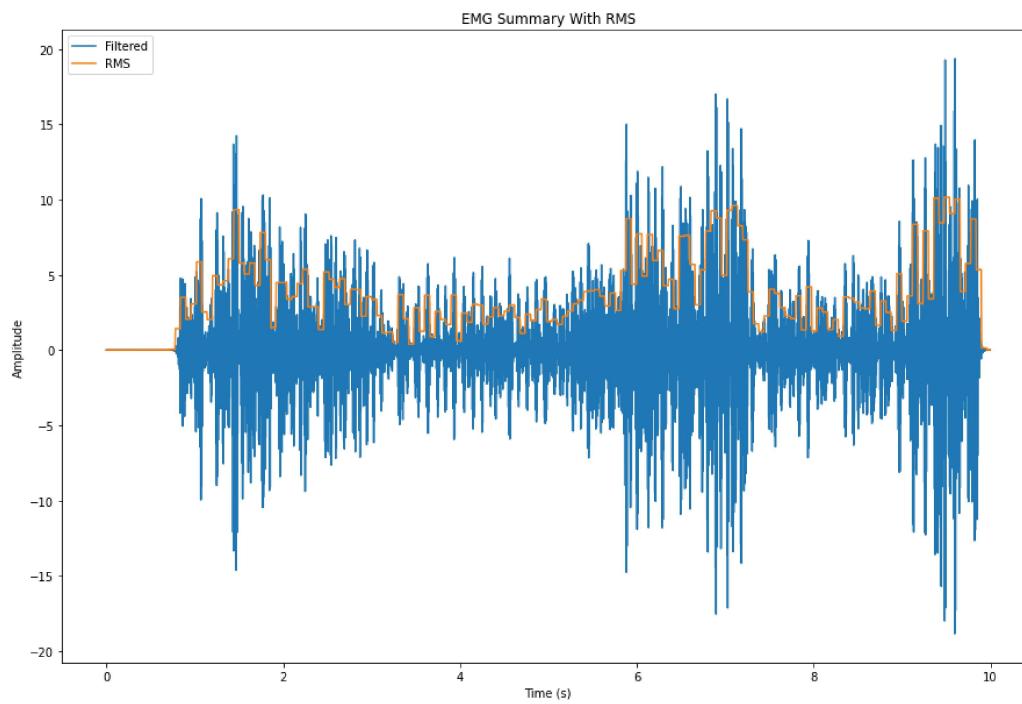


```
In [18]: #三頭肌最大出力分析
```

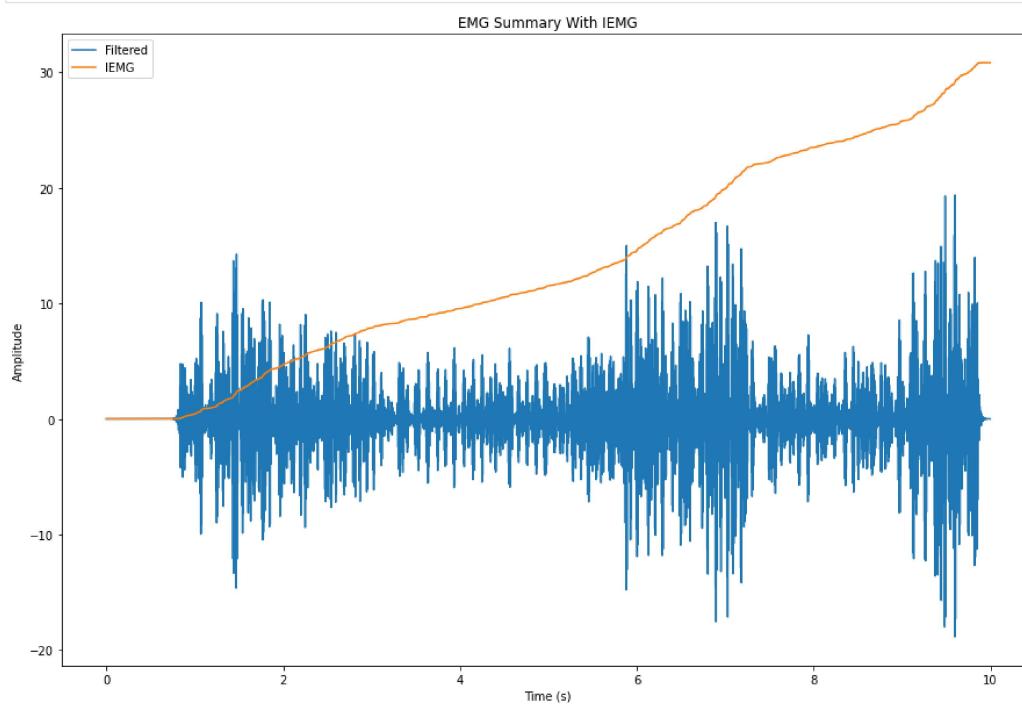
```
In [19]: Signal2 = np.loadtxt('/home/chenwunyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/三頭肌最大出力.txt')
Processed_Signal2 = biosppy.signals.emg.emg(signal=Signal2, sampling_rate=250, show=True)
```



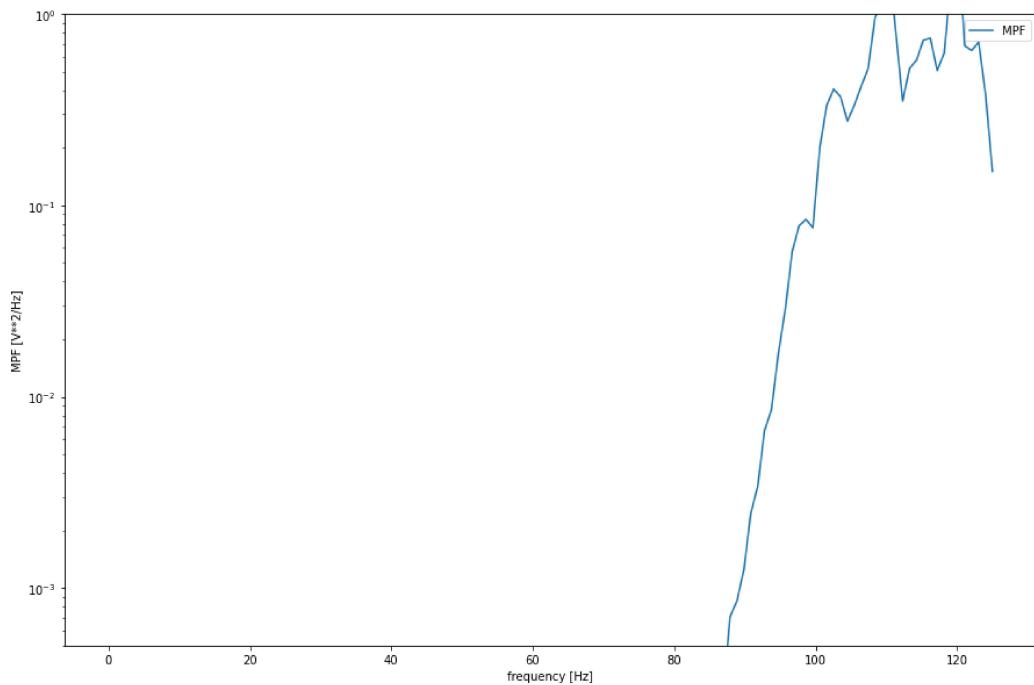
```
In [20]: RMS_Plot(Processed_Signal2[0], Processed_Signal2[1], 15)
```



```
In [21]: IEMG_Plot(Processed_Signal2[0], Processed_Signal2[1])
```



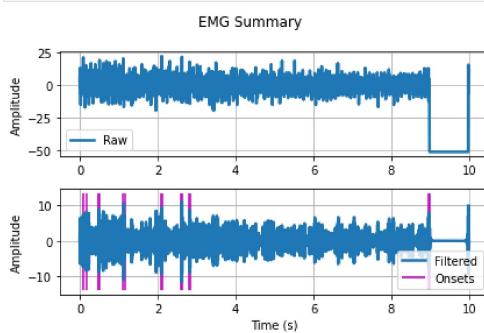
```
In [22]: Plot_MPF(Processed_Signal2[1], 250)
```



In [23]: #二頭肌持続出力分析

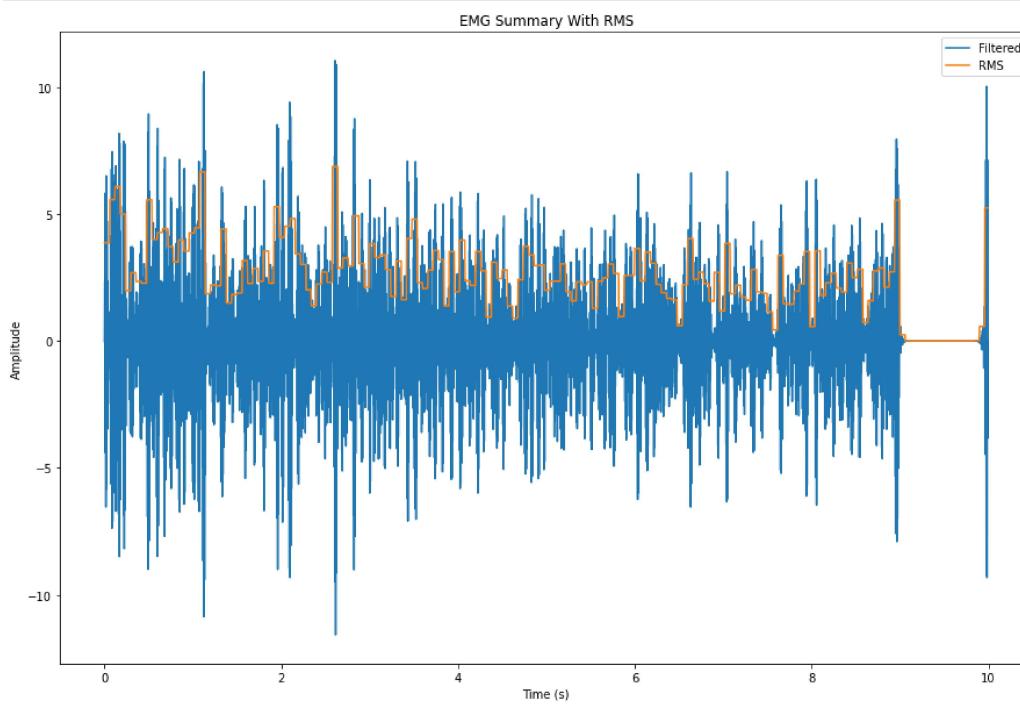
In [24]:  

```
Signal3 = np.loadtxt('/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/二頭肌持續出力.txt')
Processed_Signal3 = biosppy.signals.emg(signal=Signal3, sampling_rate=250, show=True)
```



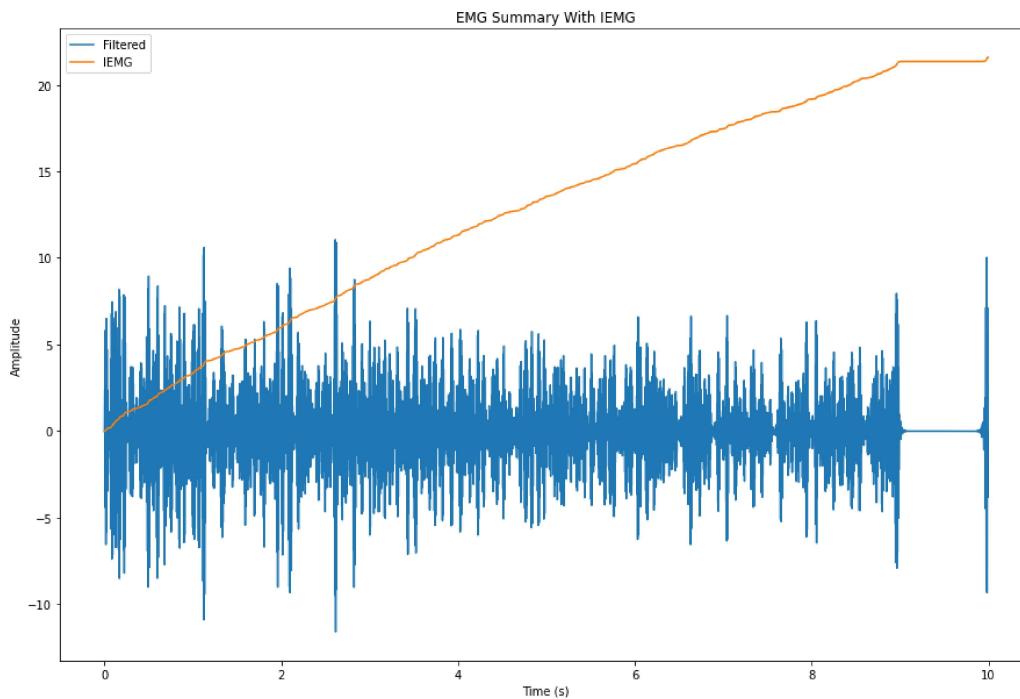
In [25]:  

```
RMS_Plot(Processed_Signal3[0], Processed_Signal3[1], 15)
```

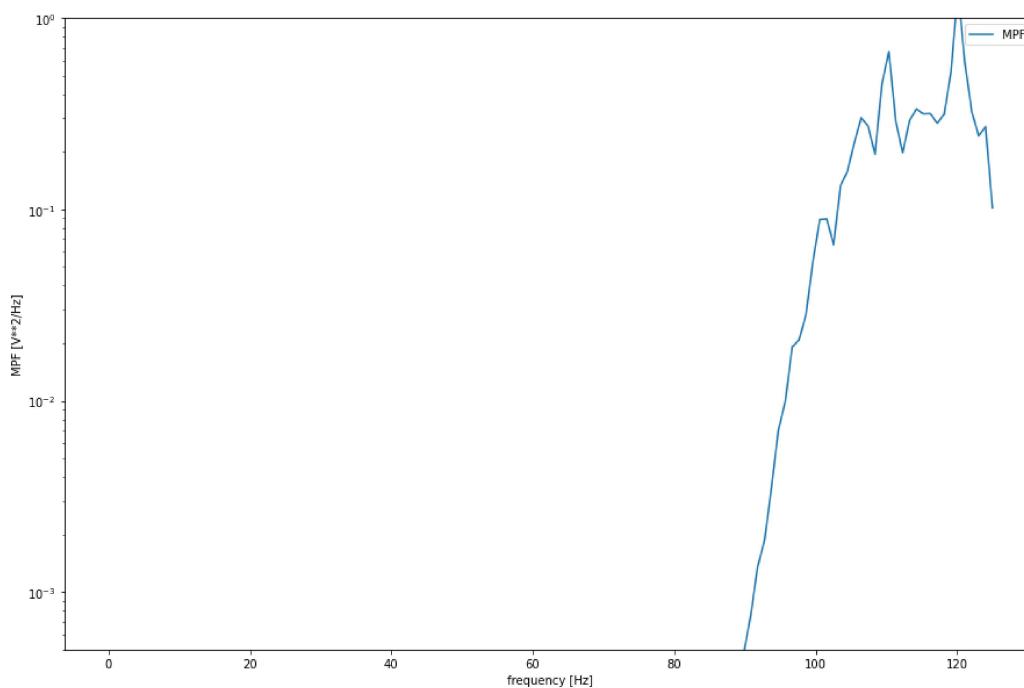


In [26]:  

```
IEMG_Plot(Processed_Signal3[0], Processed_Signal3[1])
```

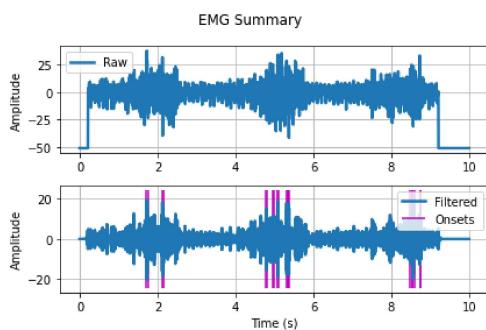


```
In [27]: Plot_MPf(Processed_Signal3[1], 250)
```

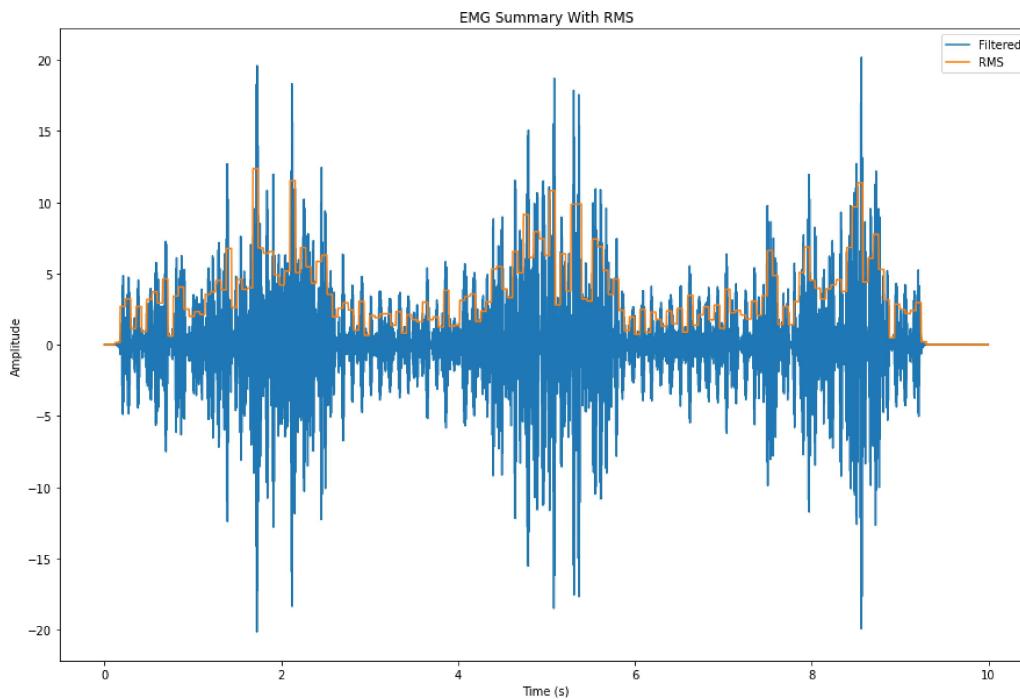


```
In [28]: #二頭肌最大出力分析
```

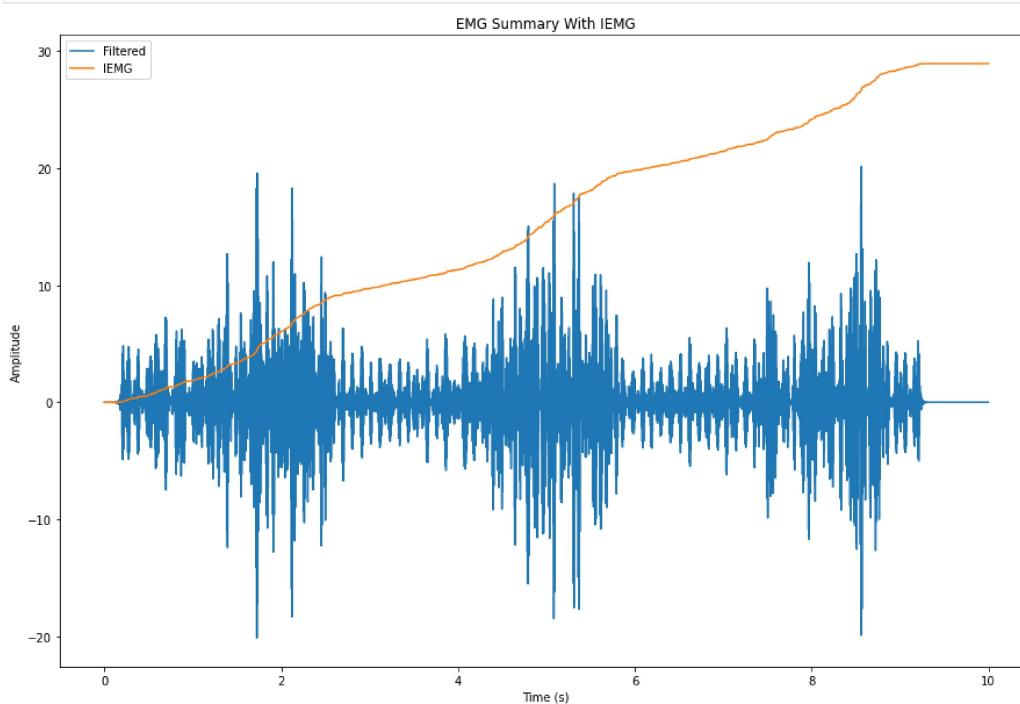
```
In [29]: Signal4 = np.loadtxt('/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/二頭肌最大出力.txt')
Processed_Signal4 = biosppy.signals.emg.emg(signal=Signal4, sampling_rate=250, show=True)
```



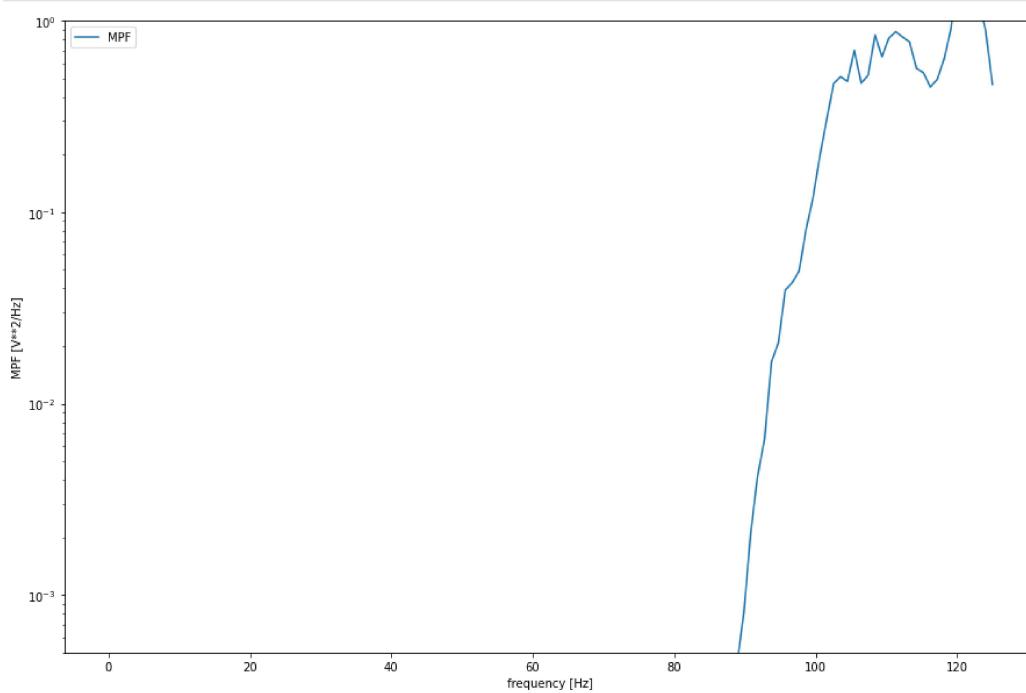
```
In [30]: RMS_Plot(Processed_Signal4[0], Processed_Signal4[1], 15)
```



```
In [31]: IEMG_Plot(Processed_Signal4[0], Processed_Signal4[1])
```

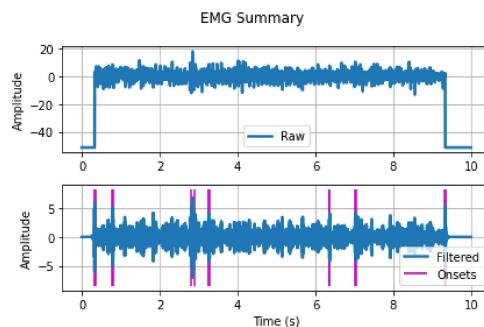


```
In [32]: Plot_MPF(Processed_Signal4[1], 250)
```

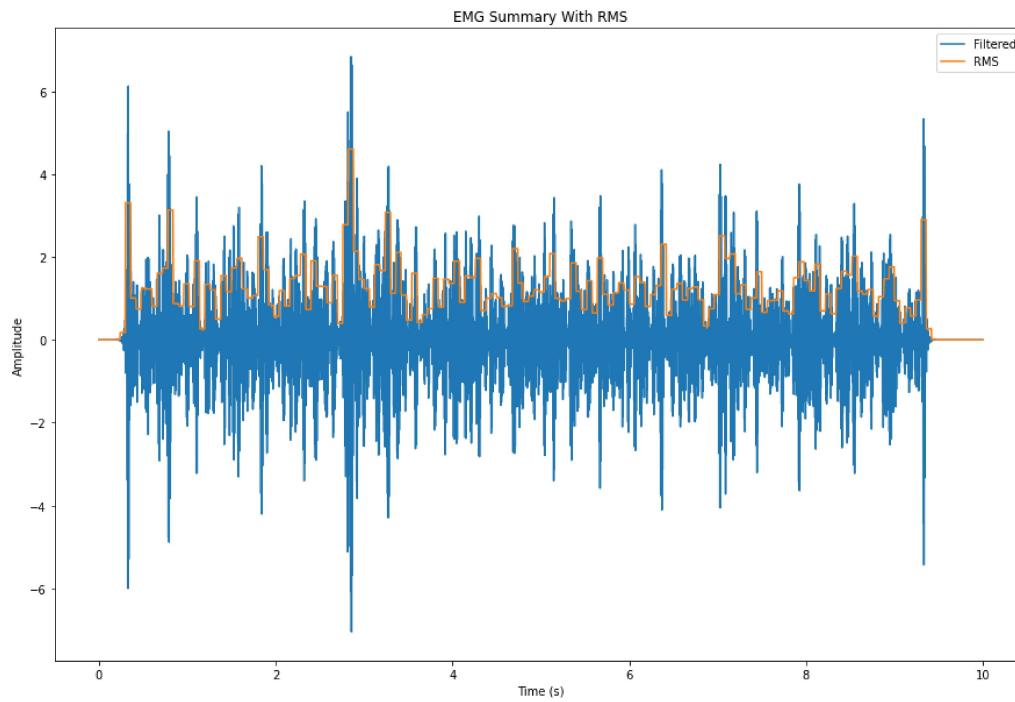


```
In [33]: #股二頭肌持續出力分析
```

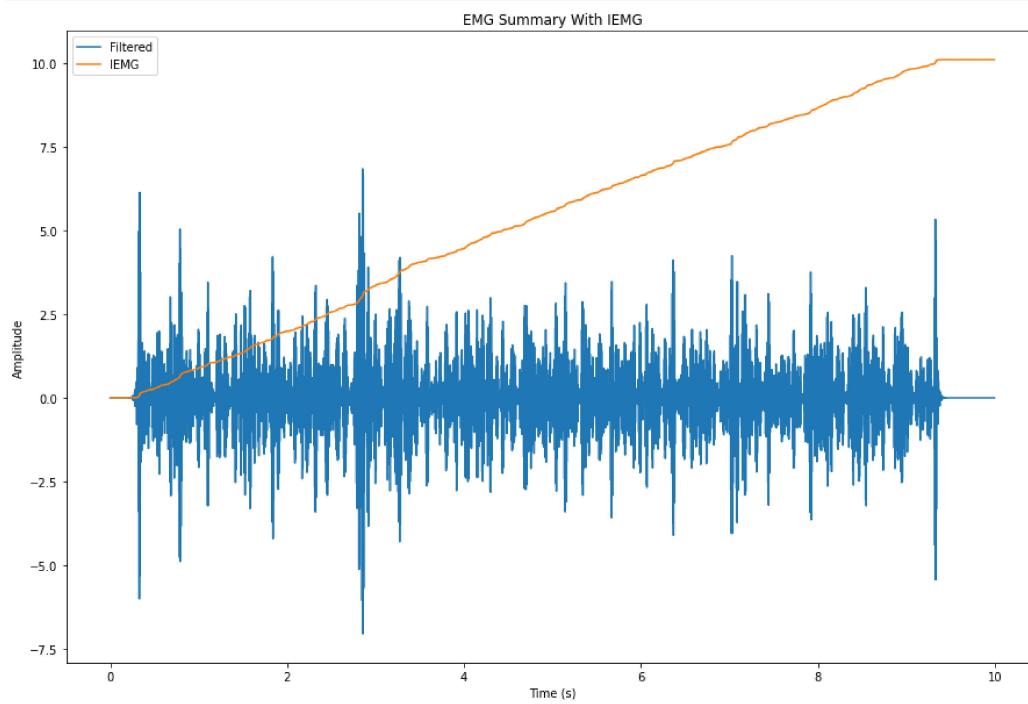
```
In [34]: Signals = np.loadtxt('/home/chenwunyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股二頭肌持續出力.txt')
Processed_Signals5 = biosppy.signals.emg(emg(signal=Signals, sampling_rate=250, show=True))
```



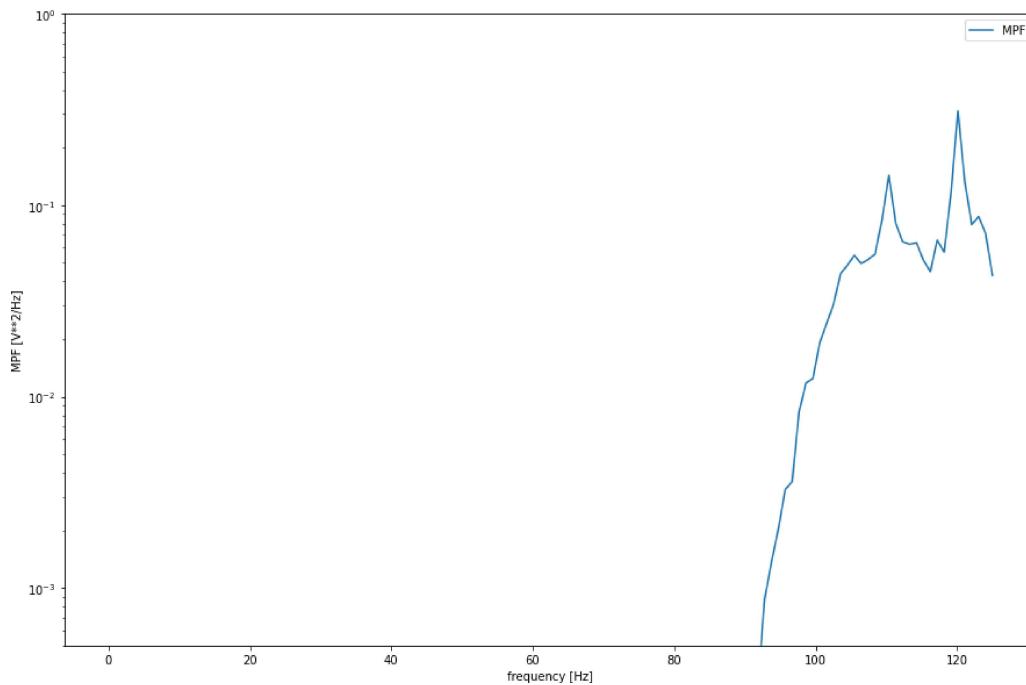
In [35]: `RMS_Plot(Processed_Signals5[0], Processed_Signals5[1], 15)`



In [36]: `IEMG_Plot(Processed_Signals5[0], Processed_Signals5[1])`

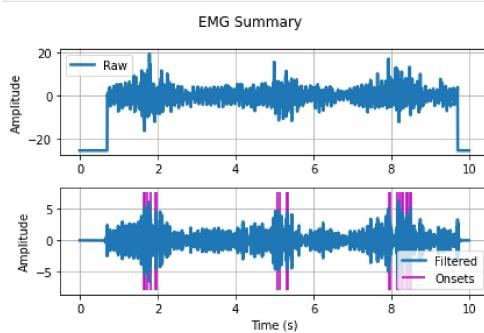


In [37]: `Plot_MPF(Processed_Signals5[1], 250)`

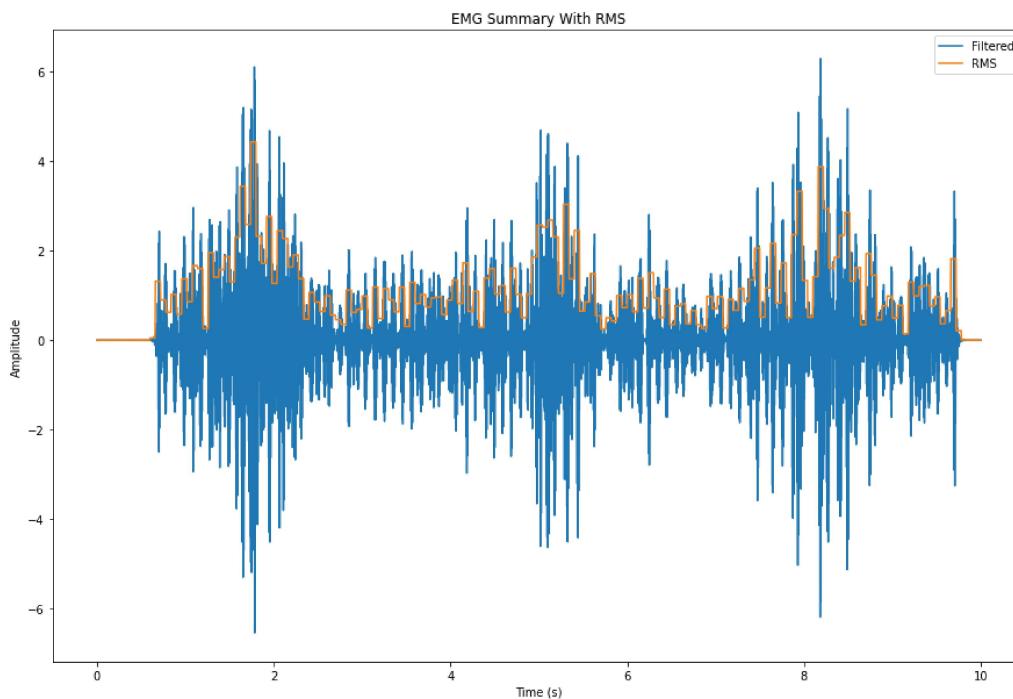


In [38]: #股二頭肌最大出力分析

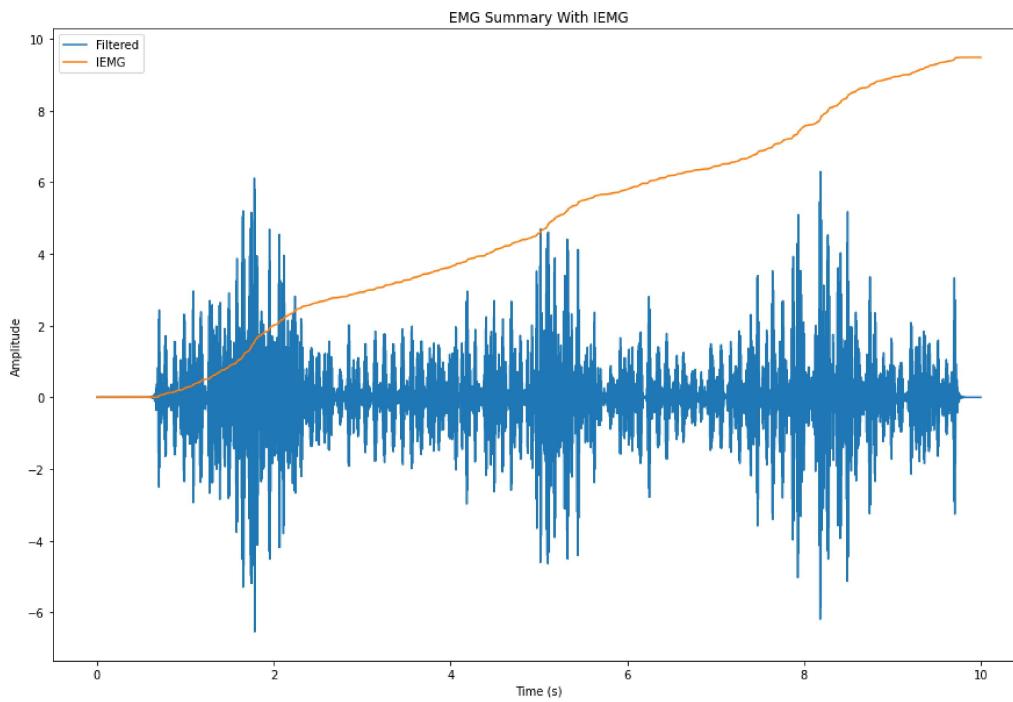
```
Signal6 = np.loadtxt('/home/chenwunshyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股二頭肌最大出力.txt')
Processed_Signal6 = biosppy.signals.emg(signal=Signal6, sampling_rate=250, show=True)
```



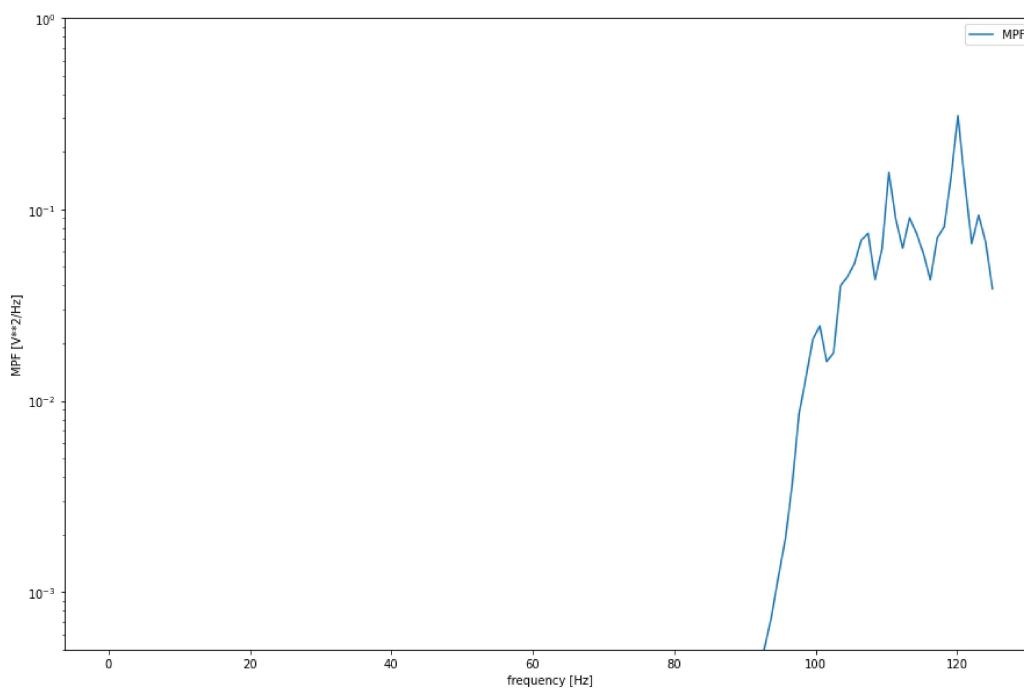
In [40]: RMS\_Plot(Processed\_Signal6[0], Processed\_Signal6[1], 15)



In [41]: IEMG\_Plot(Processed\_Signal6[0], Processed\_Signal6[1])

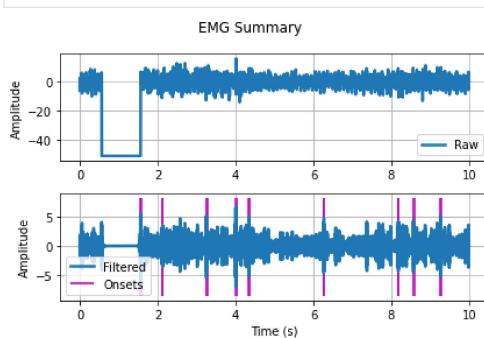


In [42]: `Plot_MPF(Processed_Signal6[1], 250)`

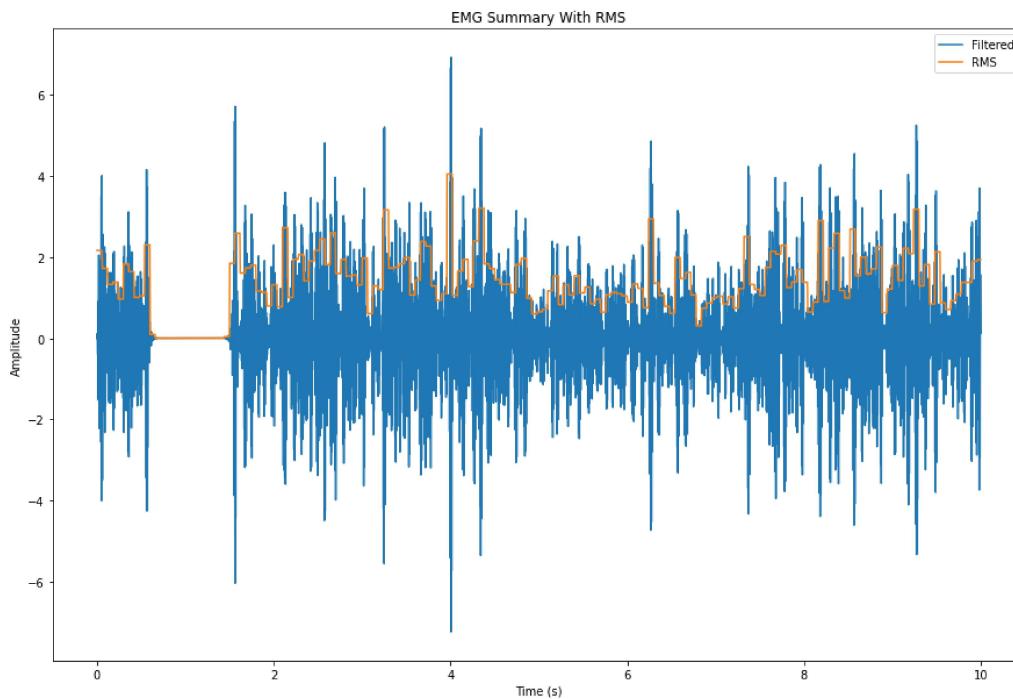


In [43]: `#股内側肌持続出力分析`

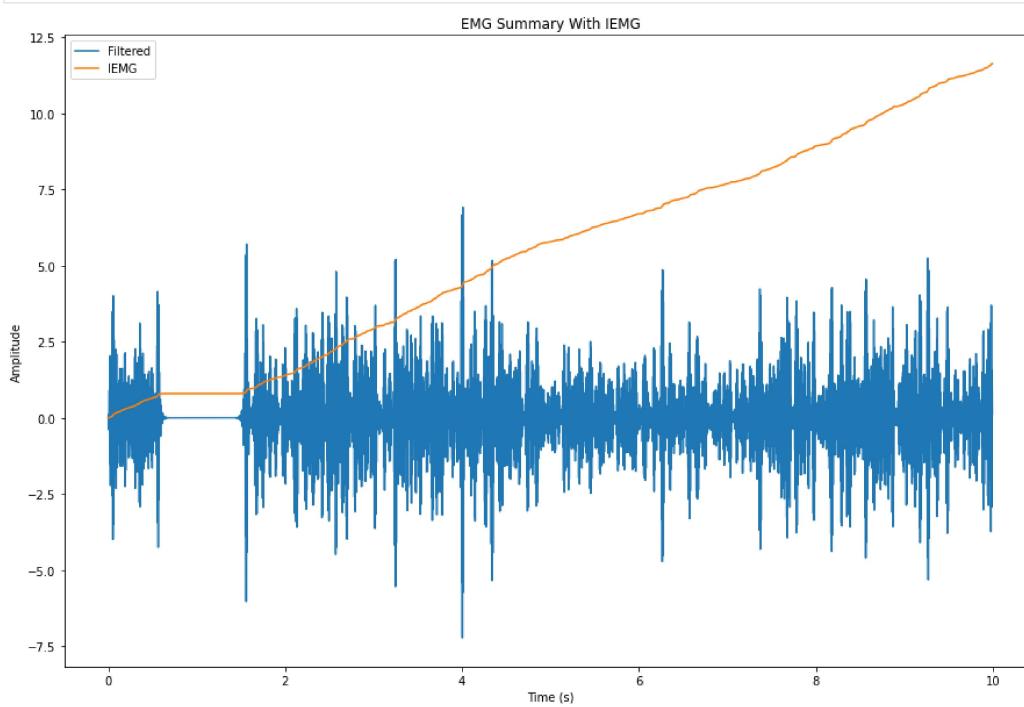
In [44]: `Signal7 = np.loadtxt('/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股内側肌持続出力.txt')  
Processed_Signal7 = biosppy.signals.emg.emg(signal=Signal7, sampling_rate=250, show=True)`



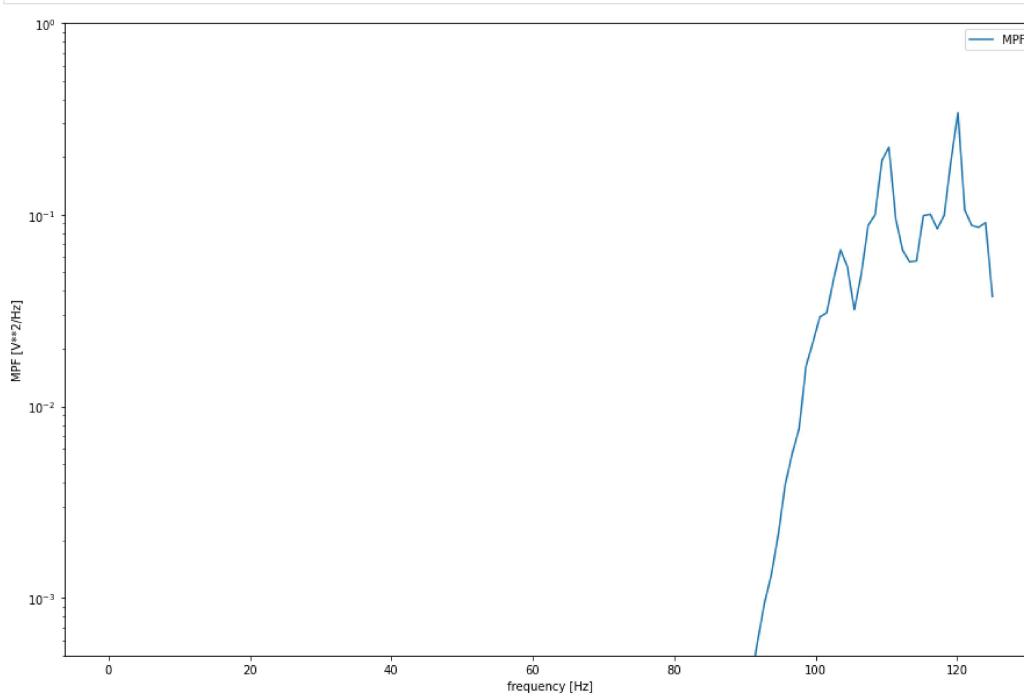
In [45]: `RMS_Plot(Processed_Signal7[0], Processed_Signal7[1], 15)`



```
In [46]: IEMG_Plot(Processed_Signal7[0], Processed_Signal7[1])
```

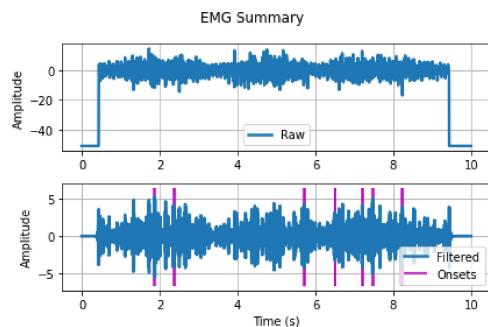


```
In [47]: Plot_MPF(Processed_Signal7[1], 250)
```

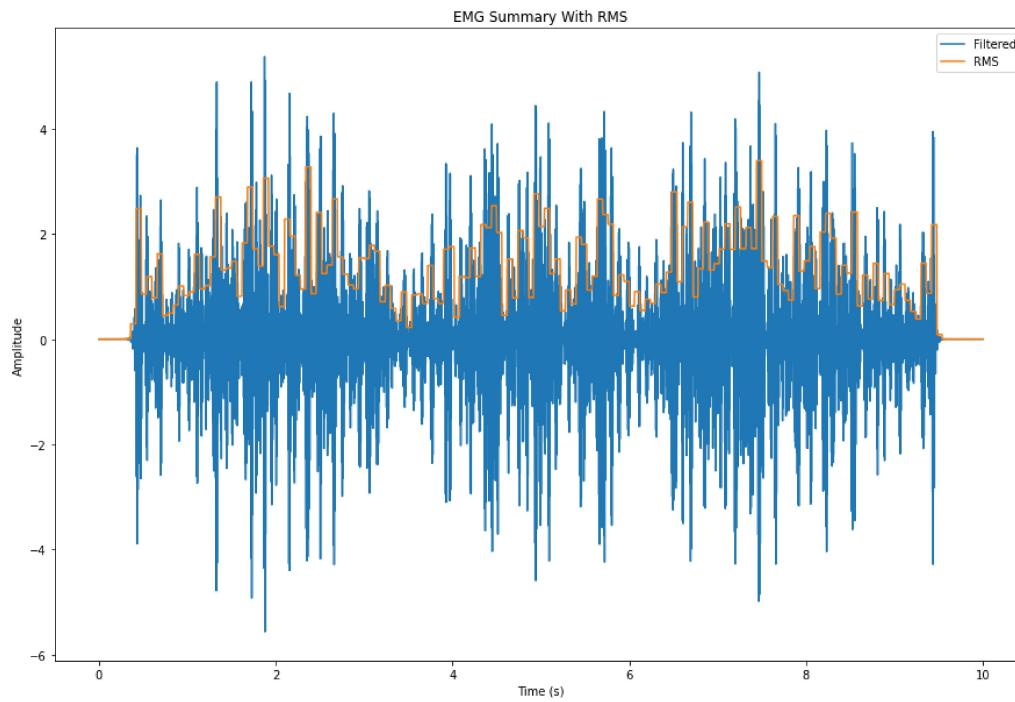


```
In [48]: #股内側肌最大出力分析
```

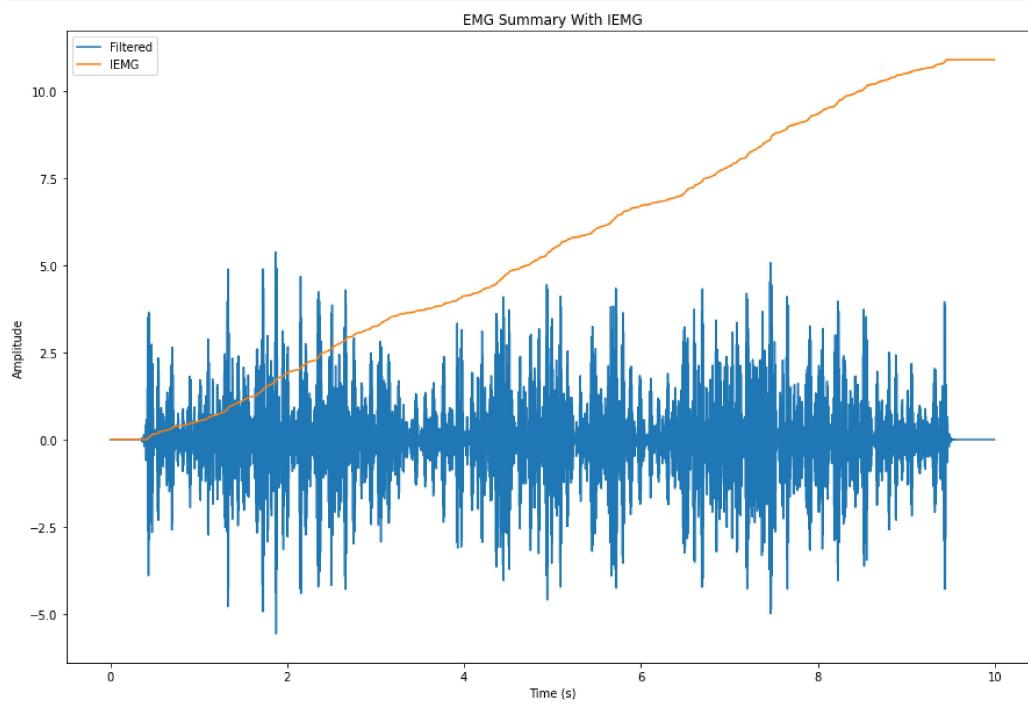
```
In [49]: Signal8 = np.loadtxt('/home/chenwunyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股内側肌最大出力.txt')
Processed_Signal8 = biosppy.signals.emg.emg(signal=Signal8, sampling_rate=250, show=True)
```



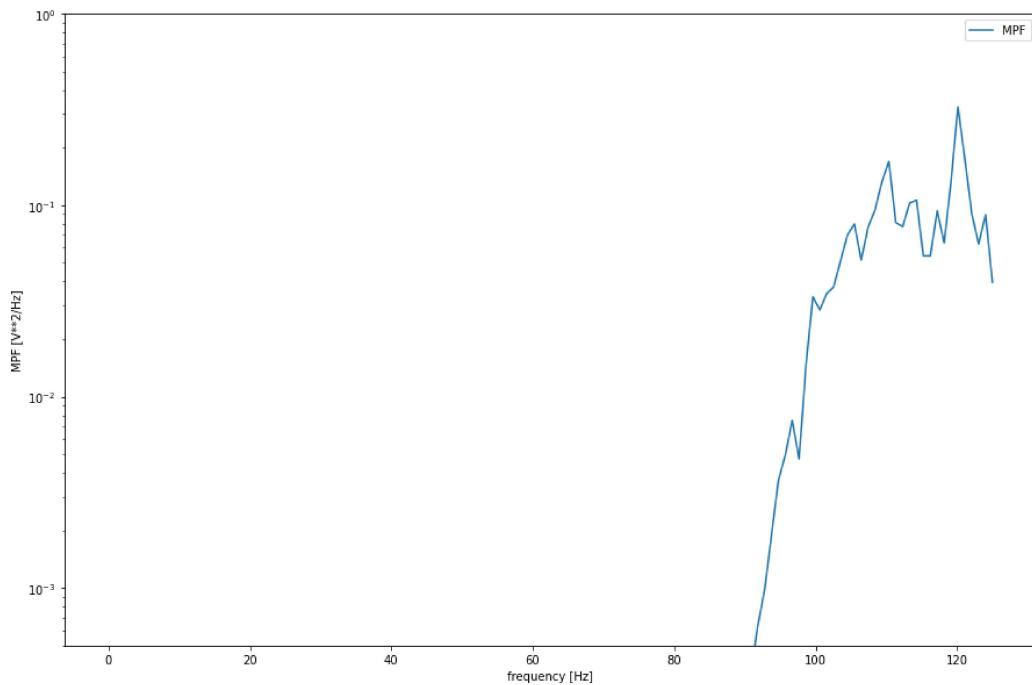
```
In [50]: RMS_Plot(Processed_Signal8[0], Processed_Signal8[1], 15)
```



```
In [51]: IEMG_Plot(Processed_Signal8[0], Processed_Signal8[1])
```

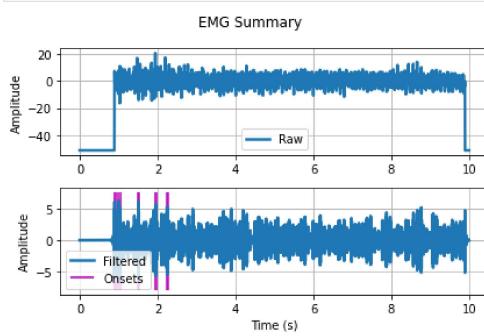


```
In [52]: Plot_MPF(Processed_Signal8[1], 250)
```

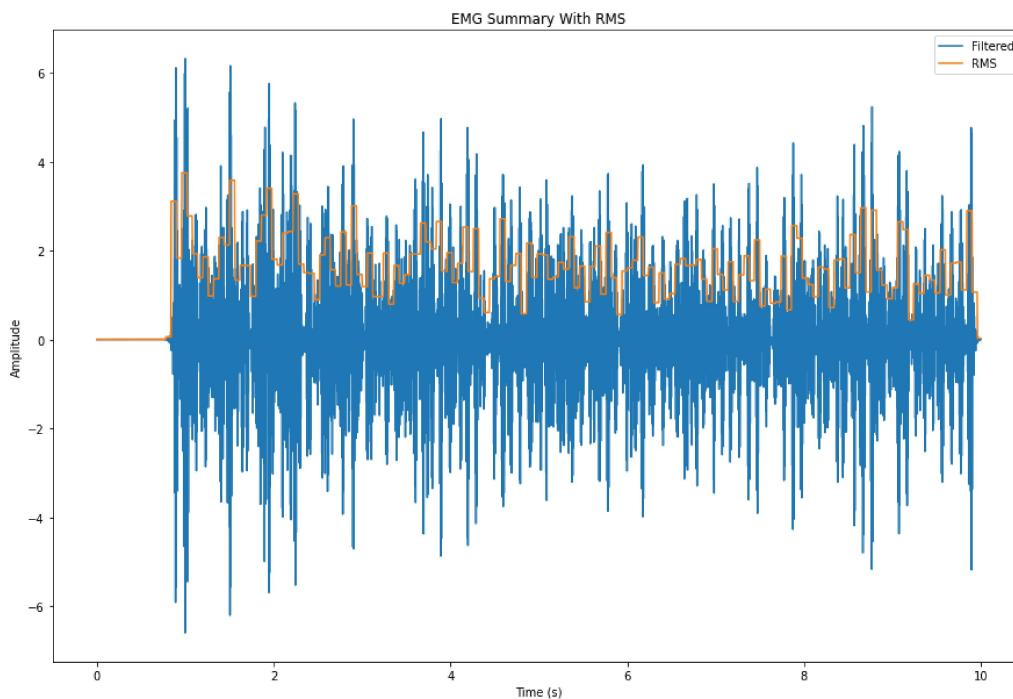


```
In [53]: #股外側肌持續出力分析
```

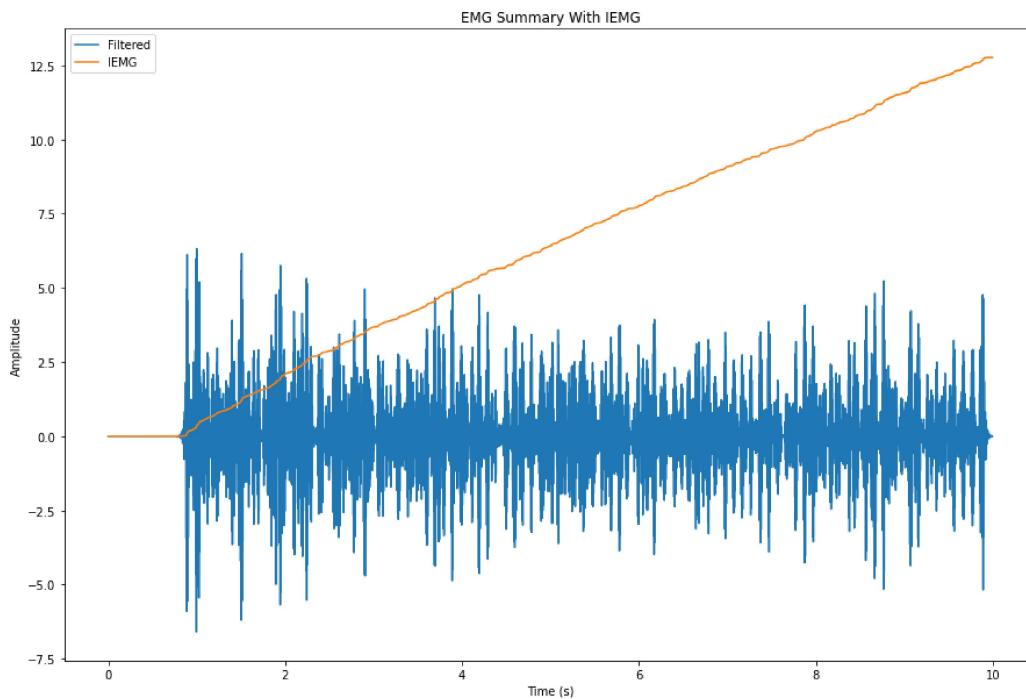
```
In [54]: Signal9 = np.loadtxt('/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股外側肌持續出力.txt')
Processed_Signal9 = biosppy.signals.emg(signal=Signal9, sampling_rate=250, show=True)
```



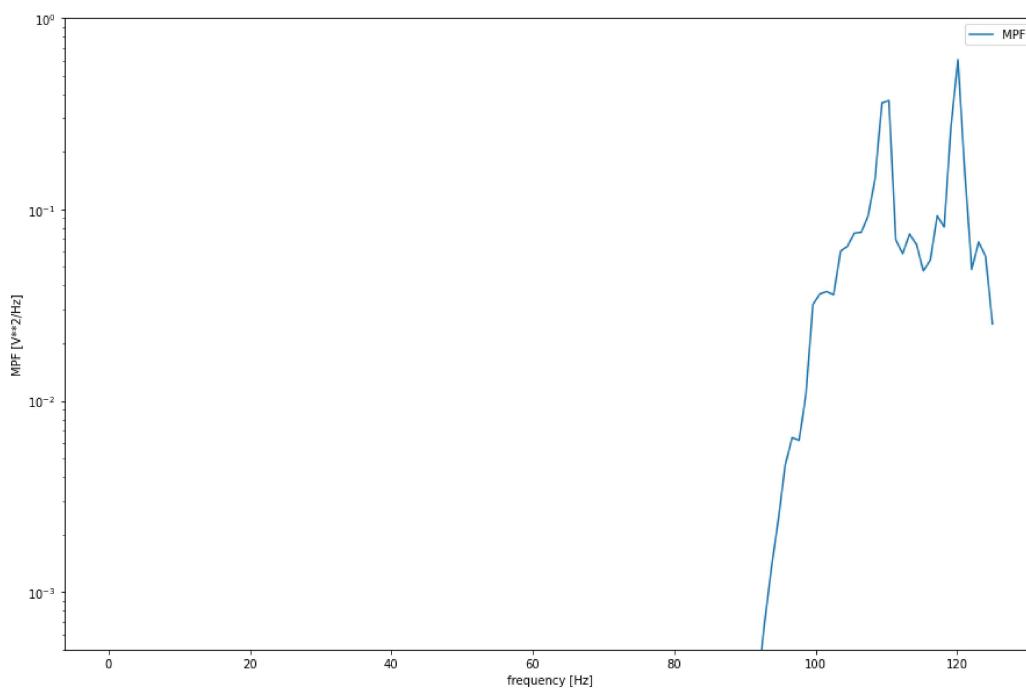
```
In [55]: RMS_Plot(Processed_Signal9[0], Processed_Signal9[1], 15)
```



```
In [56]: IEMG_Plot(Processed_Signal9[0], Processed_Signal9[1])
```

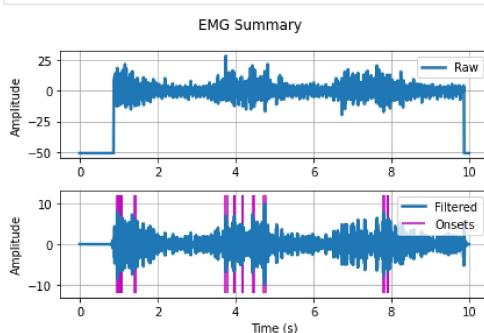


```
In [57]: Plot_MPf(Processed_Signal19[1], 250)
```

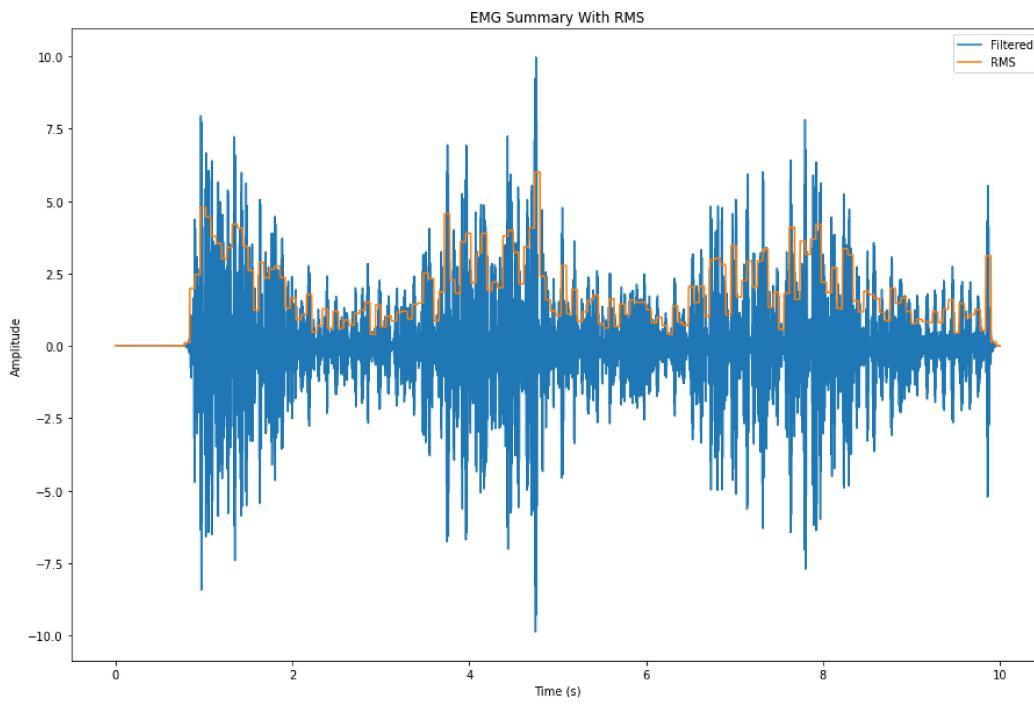


```
In [58]: #股外側肌最大出力分析
```

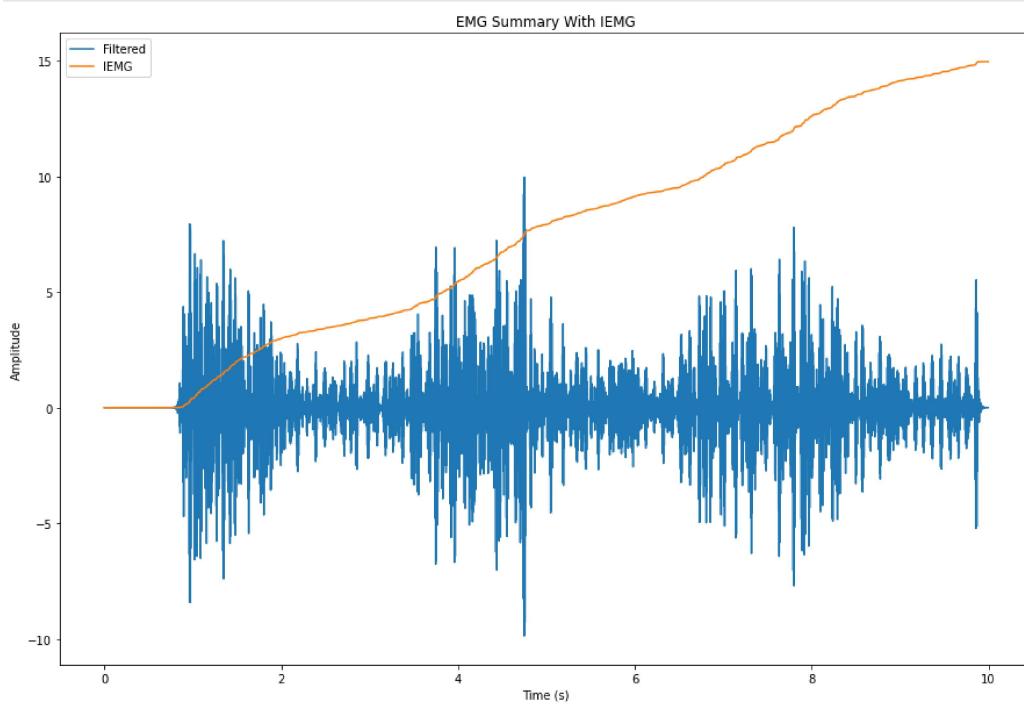
```
In [59]: Signal10 = np.loadtxt('/home/chenwunsyuan/Documents/Python_EMG_Analysis_Project/Raw_Data/TXT/股外側肌最大出力.txt')
Processed_Signal10 = biosppy.signals.emg.emg(signal=Signal10, sampling_rate=250, show=True)
```



```
In [60]: RMS_Plot(Processed_Signal10[0], Processed_Signal10[1], 15)
```



```
In [61]: IEMG_Plot(Processed_Signal10[0], Processed_Signal10[1])
```



```
In [62]: Plot_MPF(Processed_Signal10[1], 250)
```

